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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/766,288	01/26/2004	Brian F. Conaghan	9149/2/1	9349

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EXAMINER

VIJAYAKUMAR, KALLAMBELLA M

ART UNIT	PAPER NUMBER
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1751

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/23/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/766,288

Applicant(s)

CONAGHAN ET AL.

Examiner

Kallambella Vijayakumar

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12/26/2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-62 is/are pending in the application.
- 4a) Of the above claim(s) 1-47 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 48-53, 58-60, 62 is/are rejected.
- 7) ☒ Claim(s) 54-57 and 61 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Applicant's election without traverse of Claims 48-62 in the reply filed on 12/26/2006 is acknowledged. Claims 1-47 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

The subject matter of claim 48 containing a method of preparing a metal conductor on a substrate using a composition containing "an organic coated metallic nanoparticle" was not disclosed in the parent application with SI No 10/354154, and accordingly gets a priority date as of the filing date of the application i.e. January 26, 2004.

The information disclosure statement (IDS) submitted on 07/12/2004, 09/02/2004 and 02/02/2007 are in compliance with the provisions of 37 CFR 1.97, and accordingly, the information disclosure statements have been considered by the examiner.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 48 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "well-consolidated" in claim 48 is a relative term which renders the claim indefinite. The term "well-consolidated" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. If ten elements make a metal conductor to be consolidated, how many such elements does Applicant's "well-consolidated" conductor need to have.

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Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1. Claims 48-53 and 58-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuba et al (WO 02/35554).

The US Patent 7,081,214 is being used as the English Translation of the WO document in the present rejection.

Matsuba et al teaches forming a high density circuit printed over a substrate by printing a conductive paste over a substrate and sintering it at low temperatures forming conductive traces, wherein the paste comprised a dispersion of: (i). Metal fillers with a particle diameter of 0.5-20 micron; (ii). Ultrafine metal

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powder with a particle size of 1-100 nm wherein the surface of ultrafine particles was coated with a compound containing N, O, S atoms such as alkylamines, fatty acids and alkanethiols <ROM>; (iii). A resin that enables low-temperature sintering of the metal particles upon heat treatment; and (iv). A solvent (Abstract; CI-1, Ln 15-24; CI-5, Ln 11-54; CI-12, Ln 66 – CI-13, Ln 16; CI-18, Ln 4-10; CI-19, Ln 45-48; CI-25, Ln 8-14; CI-26, Ln 36-44; CI-27-28; Examples 1-1 and 1-2). The prior art teaches, printing the paste over a substrate using a mask and curing the paste at temperatures less than 300C, preferably 250C or lower, and generally 180-230C forming low impedance conductor with a film with a thickness of 40 micron.

The prior art fails to teach a method step of heating the substrate for a time less than 30 mins per the claim 48.

However, the prior art teaches curing the coated composition containing silver nanoparticles at a temperature of 150C for 30 mins (CI-32, Ln 48-52), and varying the temperature and time, wherein it would have been obvious to a person of ordinary skilled in the art to optimize the curing time and/or temperature by routine experimentation with reasonable expectation of success, because ultrafine silver particles sinter at lower temperatures. Generally, differences in concentration, period or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration, period or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955), See also *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) (prior art suggested proportional balancing to achieve desired results in the formation of an alloy). This will further meet the limitation of claim-60.

With regard to claims 49 and 53, the prior art teaches using Ag-metal ultrafine particles with a particle diameter of 1-200 nm.

With regard to claim-51, the component ratios in prior art composition (Examples 1-1 and 1-2 in CI 27-28) will overlap with the instant claimed nanoparticle ratios in the claim.

With regard to claim 52, the prior art teaches using 5-30 parts by weight of resin per 100 parts by wt of total metal fillers (CI-18, Ln 24-32).

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With regard to claims 58-59, the prior art teaches printing the paste over the surface of a substrate by screen printing.

2. Claims 50 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuba et al (WO 02/35554) in view of Kydd (US 5,882,722).

The disclosure by Matsuba et al on the composition and method of making the fine circuits by high density printing as set forth in rejection-1 under 35 USC 103(a) is herein incorporated.

The prior art fails to teach making the composition by roll-mill or printing it over the claimed organic substrates, although teach making the composition by uniformly dispersing the components by kneading and suggest using the composition in forming superfine high-density and low-impedance circuits over flexible circuit boards (CI-1, Ln 15-24; CI-19, Ln 59 to CI-20, Ln 11).

In the analogous art, Kydd teaches forming a conductor ink containing Ag-nanoparticles, Ag-neodecanoate <ROM> and solvent <cure temp lowering agent> by homogeneously mixing the components in a roll-mill, and forming conductive traces by printing conductor circuits over organic substrates such as epoxy-glass and Kapton (CI-7, Ln 20-33; C-9, Ln 42-45; 59-60).

With regard to claim 50, it would have been obvious to a person of ordinary skilled in the art to combine the prior art teachings to homogeneously blend the components of Matsuba et al in a roll-mill as a functional equivalent of mixing in making the paste with reasonable expectation of success, because the teachings are in the analogous art and suggestive of the claimed method step.

With regard to claim 60, it would have been obvious to a person of ordinary skilled in the art to combine the prior art teachings to substitute the glass substrate of Matsuba et al with either epoxy or Kapton substrates of Kydd as a functional equivalent with reasonable expectation of success, because the teachings are in the analogous art and Matsuba is suggestive of making flexible printed circuit boards.

3. Claims 48-51, 53, 58-60 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kodas et al (US 2003/0180451).

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Kodas et al teach a composition for fabricating electrical conductive features with low resistances over organic substrates such as PCB comprising by printing an ink composition comprising: (i). Nanoparticles of conductive metals such as silver with a particle size of 10-80 nm, (ii). Micron-sized conductive particles where its composition is similar to that of nanoparticles i.e. Ag, and with a particle size of 0.3-3 micron, (iii). Solvent such as terpineol, toluene, ethylene glycol or DMAC <cure temperature lowering agent> and (iv). Binder such as acrylics polymers (Abstract, Para: 0026, 0030-33, 0060, 0063-64, 0072, 0116-117, 0122-123). The prior art further teaches capping the nanoparticles with polymers such as polystyrene/methacrylate or organometallic agents <ROM> (Para 0063-64). The prior art teaches ink-jet printing of the conductive ink over the substrates such as paper and polyester and curing at temperatures not greater than 150C forming the metallic conductive features (Para 0149-0153, 0155).

The prior art fails to teach a method step of heating the substrate for a time less than 30 mins per the claim 48.

However, the prior art teaches curing the coated composition at temperatures less than 250C, even less than 100C, and varying the time or the composition to reduce the conversion temperature in forming the conductive features (Para 0149-0152, 0153; Pg-32, Table-9; Pg-35, Tables 10-11), wherein it would have been obvious to a person of ordinary skilled in the art to optimize the curing time and/or temperature by routine experimentation with reasonable expectation of success, because prior art is concerned about reducing the sintering/curing to lower temperatures. Generally, differences in concentration, period or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration, period or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955), See also *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) (prior art suggested proportional balancing to achieve desired results in the formation of an alloy). This will also meet the limitation of claim-60.

With regard to claims 49 and 53, the prior art teaches using metal ultrafine particles such as Ag with a particle diameter of 10-80 nm.

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With regard to claim 50, the prior art teaches homogeneously mixing the components in a 3-roll mill (Para 0057).

With regard to claim 51, the prior art teaches a metal particle content of less than 75 wt%, wherein the micron particle load does not exceed 50 wt% and the total load of nanoparticles not exceeding 75 wt%, and these ratios will overlap over claimed nanoparticle composition in the composition (Para 0137).

With regard to claims 58-59, the prior art teaches printing the paste over the surface of a substrate and the use of screen printing in such applications.

Allowable Subject Matter

Claims 54-57 and 61 are objected to as dependent upon the rejected base claim, and would be allowable if rewritten including the limitations of the base claims and any intervening claims.

The prior art of record neither teaches nor fairly suggest a method of making a conductor over a substrate meeting the limitations of the method steps and the materials processed therein.

Conclusion

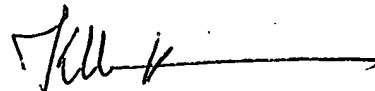
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kallambella Vijayakumar whose telephone number is 571-272-1324. The examiner can normally be reached on 8.30-6.00 Mon-Thu, 8.30-5.00 Alt Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Douglas McGinty can be reached on 571-272-1029. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KMV
March 07, 2007.

A handwritten signature in black ink, appearing to be 'Kall', followed by a long horizontal line extending to the right.

PATENT EXAMINER